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## (54) Apparatus for forming a band blade

Vorrichtung zur Herstellung eines Stanzmessers

Dipositif pour faire un outil à matricer

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(56) References cited:
**EP-A- 0 962 274**
**US-A- 5 771 725**



EP 1 129 799 B1

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## Description

**[0001]** This invention relates to a working apparatus and a working method for band blade.

**[0002]** Conventionally, in a working apparatus for a band blade 1, a press progressive die 15 for cutting and notching the band blade 1 is disposed in front of a bender 11, as shown in Figure 20, or the press progressive die 15 is disposed in front of the bender 11 and a terminal-cutting die 19 is disposed behind the bender 11 as shown in Figure 21.

**[0003]** The band blade 1 is used for a trimming die for cutting plural products of predetermined configurations by shearing out of single or plural sheets, or coiled material. The band blade 1 is also called Thomson blade. And, the products in the predetermined configurations include extended cigarette boxes, caramel boxes, cardboard boxes, pieces of jigsaw puzzels, etc.

**[0004]** Generally used size (thickness) of the band blade 1 is about 0.7mm. For this condition, in bending by the bender 11 after the cutting of the band blade 1, when the band blade 1 goes through the press progressive die 15, a guide 13, and the bender 11 having narrow gaps (slits), only little amount of scrap, dust, and flush generated by the cutting of the band blade causes jam, malprogression, and mechanical halt. It is necessary to dissemble the press progressive die 15 and the bender 11 to recover the working, and this frequently generates a loss of production time.

**[0005]** And, in case that the terminal-cutting die 19 is a plier-shaped cutter 46 composed of two pieces having one blade respectively, one of the blades may slide in a direction of an arrow P and the band blade 1 may be bent in a direction of an arrow 0 in cutting the band blade 1. For this reason, the plier-shaped cutter 46 has to be made strong as to have a large supporting point 47 and blade width R. In case that the terminal-cutting die 19 disposed behind the bender 11 is the plier-shaped cutter 46 as described above, an end portion C of the band blade 1 as a finished product (refer to Figure 7) becomes long because the terminal-cutting die 19 is a large device (having large blade width R). A method of producing a band blade by means of a working apparatus comprising the features of the preamble of claim 1 is disclosed in US 5,771,725.

**[0006]** It is an object of the present invention to provide a working apparatus and method for band blade with which the conventional problems above are solved.

**[0007]** This object is solved according to the present invention by a working apparatus for band blade including the features of claim 1. Furthermore detailed embodiments are described in the dependent claims 2 and 3.

**[0008]** The present invention will be described with reference to the accompanying drawings, in which:

Figure 1 is a whole view showing an embodiment of the present invention;
Figure 2 is a partial front view of a band blade;
Figure 3 is a side view of Figure 2;
Figure 4 is a partial front view of a band blade of another form;
Figure 5 is a side view of Figure 4;
Figure 6 is a perspective view showing a construction of the band blade;
Figure 7 is a perspective view showing another construction of the band blade;
Figure 8 is a perspective view showing composition members;
Figure 9 is an enlarged explanatory view showing a construction of a principal portion;
Figure 10 is an explanatory view of composition members;
Figure 11 is an explanatory view of composition members;
Figure 12 is a perspective view of composition members;
Figure 13 is a perspective view of composition members;
Figure 14 is an explanatory view showing a construction of a principal portion;
Figure 15 is an explanatory view showing the construction of the principal portion;
Figure 16 is an explanatory view showing the construction of the principal portion;
Figure 17 is an explanatory view showing the construction of the principal portion;
Figure 18 is an explanatory view showing a construction of a principal portion;
Figure 19 is an explanatory view showing a construction of a principal portion of a conventional apparatus;
Figure 20 is a whole view showing a conventional embodiment; and
Figure 21 is a whole view showing another conventional embodiment.

**[0009]** Preferred embodiments of the present invention will now be described with reference to the accompanying drawings.

**[0010]** Figure 1 shows a composition of a working apparatus for working and cutting a band blade 1 into a predetermined configuration. As shown in Figure 1, this working apparatus for band blade is provided with a notching die 14 for making a notch of a predetermined configuration on a predetermined position of the band blade 1, a guide 13 for supporting the band blade 1, and cutters 12 for cutting the band blade 1. And, these devices are disposed successively from an upstream side to a downstream side in order that the notching die 14, the guide 13, the bender 11, and then, the cutters 12.

**[0011]** The band blade 1 of a long strip is inserted to a gap (slit) of the notching die 14 first, press-worked by the notching die having a predetermined configuration to form a notched portion A on the band blade 1 as shown in Figure 7. Next, the band blade 1 is sent through the guide 13, inserted to a gap (slit) of the bender 11,

and bent by the bender 11 into a predetermined configuration (having a bent portion B). Then, the bent-worked band blade 1 is terminal-cut into a predetermined configuration by the cutters 12 to obtain a finished product of the band blade 1.

**[0012]** The terminal-cut into the predetermined configuration of the band blade 1, as shown in Figures 2 and 4, includes a straight-cut portion 2 in Figure 2 and a bevel portion 3 in Figure 4 as configurations of an end or both ends of the band blade 1. The straight-cut portion 2 is formed by cutting an end portion of the band blade 1 in a direction at right angles with a longitudinal direction of the band blade 1, and the bevel portion 3 is formed by cutting an end portion of the band blade 1 in the direction at right angles with the longitudinal direction of the band blade 1 and cutting only a blade portion into a configuration with an outward inclination (with an inclination angle $\alpha$). As shown in Figure 6, in case that another band blade 1 is connected to the band blade 1 at a middle portion, the bevel portion 3 is necessary to make the blade portions continuously connected and crossed. That is to say, the inclination angles needs to correspond to an edge inclination angle $\beta$ of the band blade 1. Figure 7 shows an example of finished product which has the straight-cut portion 2, the notched portion A, the bent portion B, and the bevel portion 3 respectively formed with the notching die 14, the bender 11, and the cutter 12.

**[0013]** As shown in Figure 8, the cutter 12 has a plier-shaped configuration having a male cutting portion 21 and a female cutting portion 22. And, the male cutting portion 21 is provided with a male blade 31, the female cutting portion 22 is provided with two female blades 32 and 33, and forth ends of the female blades 32 and 33 is connected through a connecting piece 34. By this construction, rigidity of the female cutting portion 22 is remarkably enhanced. The male cutting portion 21 and the female cutting portion 22 of the cutter 12 can oscillate (as shown with an arrow T) around the supporting point 23, and the band blade 1 is sheared by engagement of the male blade 31 and a gap portion 36 between the female blades 32 and 33.

**[0014]** And, the male cutting portion 21 of the cutter 12 is provided with a guiding protruding piece 35 which guides the male blade 31 as to be inserted between the two female blades 32 and 33 of the female cutting portion 22 without deviation. As shown in Figure 9, the guiding protruding piece 35 is inserted to the gap portion 36 before the male blade 31 is inserted to the gap portion 36 (to cut the band blade 1). That is to say, the guiding protruding piece 35 is previously guided into the gap portion 36, and the band blade 1 can be cut thereafter. With this guide, the blades of the cutter 12 does not deviate (twist) in cutting the band blade 1, the male blade 31 gets into the gap portion 36 first, and the band blade 1 can be cut easily with accuracy.

**[0015]** In the cutting with the construction of the connecting piece 34 on the forth ends of the female blades 32 and 33 and the construction of the guiding protruding piece 35 of the male cutting portion 21, the band blade 1 is hardly twisted and not damaged. For this reason, the cutter can be made small as to reduce the interference with a bend-worked product portion 7 of the band blade 1 (the end portion C in Figure 7 can be made short as shown in Figure 10. And, with the constructions above, rigidity of the female cutting portion 22 is increased as to make the blade width R of the female blades 32 and 33 narrow (thin) as shown in Figure 11, and the interference with the bend-worked product portion 7 of the band blade 1 is reduced (the end portion C in Figure 7 can be made short). And, because of the small size of the cutter 12, the cutter 12 can be disposed near the bender 11 as to decrease the twist and deviation of the band blade 1, and the product is prevented from being scattered in cutting. And, plural cutters 12 may be disposed behind the bender 11 (one of the cutters 12 is for the straight-cut portion 2 and the other is for the bevel portion 3).

**[0016]** And, as shown in Figure 12 and Figure 13, the male cutting portion 21 has a male die 17 and the female cutting portion 22 has a female die 18. The male die 17 and the female die 18 can be attached to and detached from a cutter main body 16 of the cutter 12. The male die 17 and the female die 18 respectively have plural drilled holes and counterbores, plural tapped holes (not shown in the figures) corresponding to the drilled holes are formed on the cutter main body 16, and the male die 17 and the female die 18 are bolted onto the cutter main body 16 with screws 26. Figure 12 shows a state that the male die 17 and the female die 18 are attached, and Figure 13 shows a state that the male die 17 and the female die 18 are detached. With this construction, blade shape of the male die 17 and the female die 18 can be changed. That is to say, one unit of the cutter 12 can easily correspond to the straight-cut portion 2 and the bevel portion 3 (Figure 12 shows the cutter 12 for straight cut, and Figure 13 shows the cutter 12 for beveled cut).

**[0017]** And, as shown in Figures 14 through 17, the band blade 1 is cut by the male cutting portion 21 and the female cutting portion 22 respectively moved unsymmetrically by a driving mechanism 41 and a guiding mechanism 42. As shown in Figures 14 through 17, the cutter 12 is connected and fixed to a cutter frame 43, and the frame 43 can be moved from a retreat position 29 to a cutting position 28 of the band blade 1 by an elevation device (not shown in the figures). That is to say, the cutter 12 for afterwork of the bender 11 retreats to a position above the band blade 1 when the bender 11 is used, and descends to the position of the band blade 1 when the cutter 12 is used. Arrows U in Figures 14 through 17 show directions of the elevation and the descent.

**[0018]** In Figure 14, the band blade 1 is in preparation of cutting. In bending, the cutter 12 retreats to an upper position (as the cutting portions 21 and 22 are on the

retreat position 29) not to prevent the bending work. In preparation of cutting the band blade 1, the elevation device begins the descent of the cutter 12. A running roller 24 for the female cutting portion 22 is facing a groove 48 of the guiding mechanism 42. And, a rotation roller 25 for the male cutting portion 21 is in a free state, and the male blade 31 and the female blades 32 and 33 are wide-open by an elastic body such as a compression spiral spring mounted on the cutter 12.

**[0019]** Figure 15 also shows the band blade 1 in preparation of cutting. The cutter 12 is descended lower than that in Figure 14. The running roller 24 for the female cutting portion 22 mounts a protruding portion 49 of the guiding mechanism 42, the rotation roller 25 for the male cutting portion 21 is in the free state, and the male blade 31 and the female blades 32 and 33 come close.

**[0020]** Figure 16 shows starting state of cutting. In this state, the cutter 12 is descended further by the elevation device. The running roller 24 for the female cutting portion 22 completely mounts the protruding portion 49 of the guiding mechanism 42. And, the rotation roller 25 for the male cutting portion 21 is in the free state, male blade 31 and the female blades 32 and 33 come closer, and the female blades 32 and 33 reach for a position which is facing (touching) the band blade 1 to which the bending is completed (the cutting portions 21 and 22 reach for the cutting position 28).

**[0021]** Figure 17 shows cutting state of the band blade 1. In this state, although the cutter 12 stays at the position of Figure 16, the rotation roller 25 for the male cutting portion 21 is pushed in a compression direction of the elastic body 27 (a direction against reaction of the elastic body 27) by the driving mechanism 41 composed of an oil-hydraulic or pneumatic cylinder. By this movement, the male blade 31 is moved in a direction to become relatively close to the female blades 32 and 33, and the band blade 1 is cut thereby. After the cutting, the cutter 12 is retreated to the upper position (the cutting portions 21 and 22 are on the retreat position 29) by the elevation device.

**[0022]** As described above, the cutter 12 is wide-open by the elastic body 27 mounted on the cutter 12 while it is descended as shown in Figure 14 because damage caused by interference of the cutter 12 with the band blade 1, which may be swaying after the bending, can be prevented when the cutter 12 is descended to the cutting position 28. And, scrap generated in the cutting is easily removed from the cutter 12.

**[0023]** And, in the cutting of the band blade 1 by the cutter 12, only a remaining portion 5 of the notched portion A, formed by the notching die 14, may be cut as shown in Figure 18.

**[0024]** Figure 1 shows a composition of the working apparatus for working and cutting the band blade 1 into a predetermined configuration. The band blade 1 of a long strip is inserted to a gap (slit) of the notching die 14 first, press-worked by the notching die having a predetermined configuration to form a notched portion A on the band blade 1 as shown in Figure 7 (a notching process L). Next, the band blade 1 is sent through the guide 13, inserted to a gap (slit) of the bender 11, and bent by the bender 11 into a predetermined configuration (a bending process M). Then, the bent-worked band blade 1 is terminal-cut (a cutting process N) into a predetermined configuration by the cutters 12 to obtain a finished product of the band blade 1.

**[0025]** According to the working apparatus for band blade of the present invention, defection of edge-shape and bent-shape of the blade and damage are vanished in the bent product of the band blade 1 to improve working accuracy of the shape of the blade, halt of the apparatus caused by defective progression of the product and malfunction of the working apparatus is solved, the apparatus can be made simple, and maintenance of the apparatus can be easily conducted.

**[0026]** And, accuracy of the finished product can be enhanced by certain cutting of the band blade 1. Stability of the apparatus is improved because the cutter 12 itself is not damaged. And, the cutter 12 is made small to conduct working corresponding to various sizes of the finished product.

**[0027]** And, cutting configuration of the band blade 1 can be easily changed, and the blades (the male blade 31, the female blade 32) of the cutter 12 can be easily inspected and replaced.

**[0028]** Further, in cutting work, the cutter 12 and the band blade 1 are prevented from damaging each other, the band blade 1 after bending work is cut on a predetermined position, and accuracy of the product can be improved thereby.

**[0029]** According to the working method for band blade, the bent-worked product of the band blade 1 has no defection in edge-shape and bent-shape of the blade, halt of the apparatus caused by defective progression of the product and malfunction of the working apparatus is solved, the apparatus is made simple, and maintenance of the apparatus can be easily conducted.

## Claims

1. A working apparatus for a band blade having a bender (11) for bending a band blade (1) into a predetermined configuration and a cutter (12), which is disposed successively after the bender (11), for cutting the band blade (1), in which the cutter (12) has a pliers-shaped configuration having a male cutting portion (21) and a female cutting portion (22), the male cutting portion (21) is provided with a male blade (31), the female cutting portion (22) is provided with two female blades (32, 33), and front ends of the female blades (32, 33) are connected with a connecting piece (34),
**characterized in that** the male cutting portion (21) and the female cutting portion (22) of the cutter (12) are movable unsymmetrically by a driving mecha-

nism (41) and a guiding mechanism (42), while the cutter (12) is descended.

2. The working apparatus for band blade as set forth in claim 1, **characterized in that** the male cutting portion (21) of the cutter (12) is provided with a guiding protruding piece (35) for guiding the male blade (31) so as to be inserted between the two female blades (32, 33) of the female cutting portion (22) without deviation.

3. The working apparatus for band blade as set forth in claim 1 or claim 2, **characterized in that** the male cutting portion (21) of the cutter (12) is composed of a male die (17), the female cutting portion (22) of the cutter (12) is composed of a female die (18), and the male die (17) and the female die (18) are attachable to and detachable from a cutter main body (16) of the cutter (12).

**Patentansprüche**

1. Bearbeitungsvorrichtung für eine Bandschneide mit einer Biegeeinrichtung (11) zum Biegen einer Bandschneide (1) in eine vorbestimmte Konfiguration und mit einer Schneideinrichtung (12), die nach der Biegeeinrichtung (11) angeordnet ist, zum Zerschneiden der Bandschneide (1), wobei die Schneideinrichtung (12) eine zangenartige Konfiguration hat mit einem aufzunehmenden Schneidbereich (21) und einem aufnehmenden Schneidbereich (22), wobei der aufzunehmende Schneidbereich (21) mit einer aufzunehmenden Klinge (31) versehen ist und der aufnehmende Schneidbereich (22) mit zwei aufnehmenden Klingen (32, 33), und wobei vordere Enden der aufnehmenden Klingen (32, 33) mit einem Verbindungsstück (34) verbunden sind, **dadurch gekennzeichnet, dass** der aufzunehmende Schneidbereich (21) und der aufnehmende Schneidbereich (22) der Schneideinrichtung (12) unsymmetrisch mittels eines Antriebsmechanismus (41) und eines Führungsmechanismus (42) bewegbar sind, während die Schneideinrichtung (12) abgesenkt wird.

2. Bearbeitungsvorrichtung für eine Bandschneide nach Anspruch 1, **dadurch gekennzeichnet, dass** der aufzunehmende Schneidbereich (21) der Schneideinrichtung (12) mit einem hervorstehenden Führungsstück (35) zum Führen der aufzunehmenden Klinge (31) versehen ist, so dass diese ohne Abweichungen zwischen die beiden aufnehmenden Klingen (32, 33) des aufnehmenden Schneidbereichs (22) eingeführt wird.

3. Bearbeitungsvorrichtung für eine Bandschneide nach Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der aufzunehmende Schneidbereich (21) der Schneideinrichtung (12) aus einer aufzunehmenden Form (12) besteht, der aufnehmende Schneidbereich der Schneideinrichtung (12) aus einer aufnehmenden Form (18) besteht und die aufzunehmende (17) und die aufnehmende Form (18) an einem Hauptkörper (16) der Schneideinrichtung (12) anbringbar und davon lösbar sind.

**Revendications**

1. Un dispositif d'usinage pour un outil à matricer comportant une plieuse (11) servant à plier un outil à matricer (1) en une configuration prédéterminée et un outil de coupe (12), qui est placé après la plieuse, servant à couper l'outil à matricer (1), dans lequel l'outil de coupe (12) présente une configuration en forme de pinces ayant une partie coupante mâle (21) et une partie coupante femelle (22), laquelle partie coupante mâle (21) est équipée d'une lame mâle (31), laquelle partie coupante femelle (22) est équipée de deux lames femelles (32, 33), et les extrémités avant des lames femelles (32, 33) sont reliées par une pièce de liaison (34),
**caractérisé en ce que** la partie coupante mâle (21) et la partie coupante femelle (22) de l'outil de coupe (12) sont mobiles de façon non symétrique sous l'action d'un mécanisme d'entraînement (41) et d'un mécanisme de guidage (42), pendant que l'outil de coupe (12) est descendu.

2. Le dispositif d'usinage pour outil à matricer selon la revendication 1, **caractérisé en ce que** la partie coupante mâle (21) de l'outil de coupe (12) est prévue avec une pièce saillante de guidage (35) permettant de guider la lame mâle (31) de sorte à être insérée entre les deux lames femelles (32, 33) de la partie coupante femelle (22) sans le moindre écart.

3. Le dispositif d'usinage pour outil à matricer selon la revendication 1 ou la revendication 2, **caractérisé en ce que** la partie coupante mâle (21) de l'outil de coupe (12) comprend une matrice mâle (17), la partie coupante femelle (22) de l'outil de coupe (12) comprend une matrice femelle (18), et la matrice mâle (17) et la matrice femelle (18) peuvent être fixés à un corps principal d'outil de coupe (16) de l'outil de coupe (12) et sont détachables de ce corps.

Fig. 1

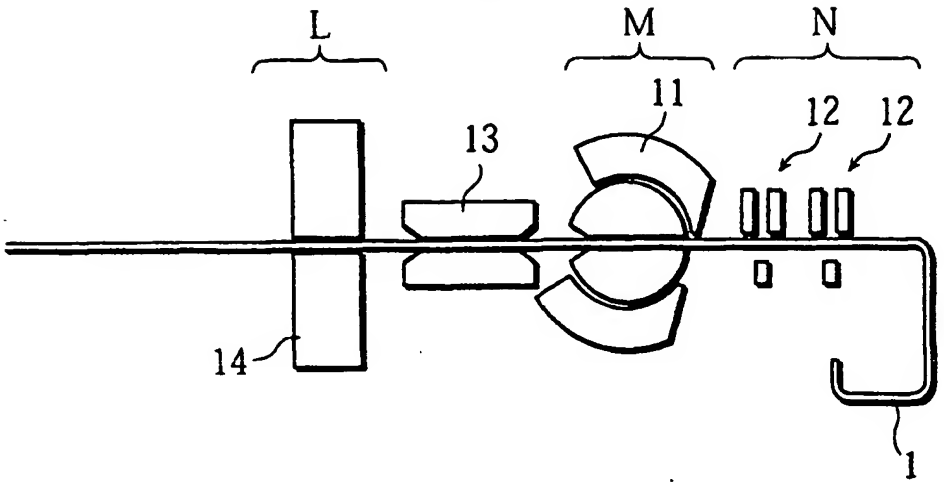



Fig. 2

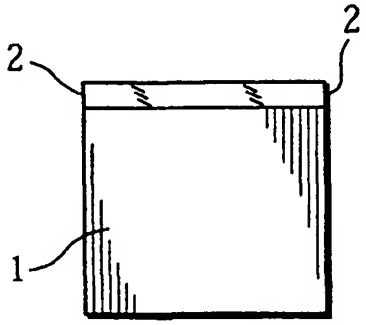



Fig. 3

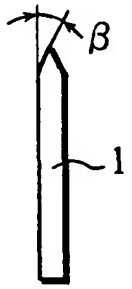


Fig. 4

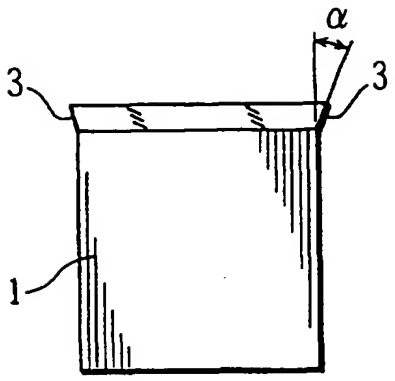



Fig. 5

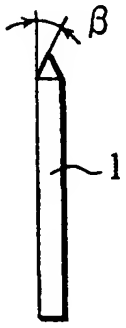


Fig. 6

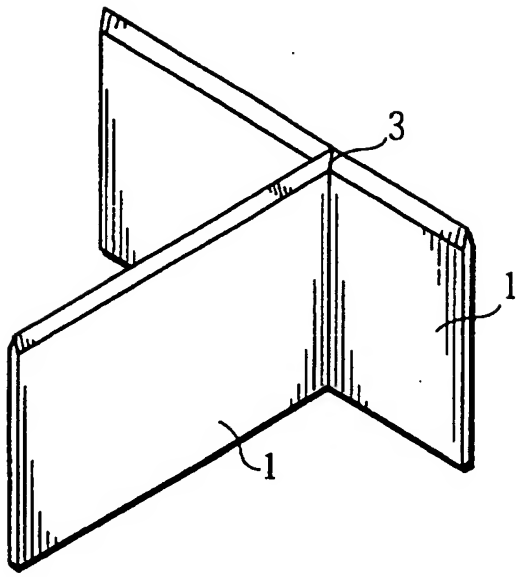



Fig. 7

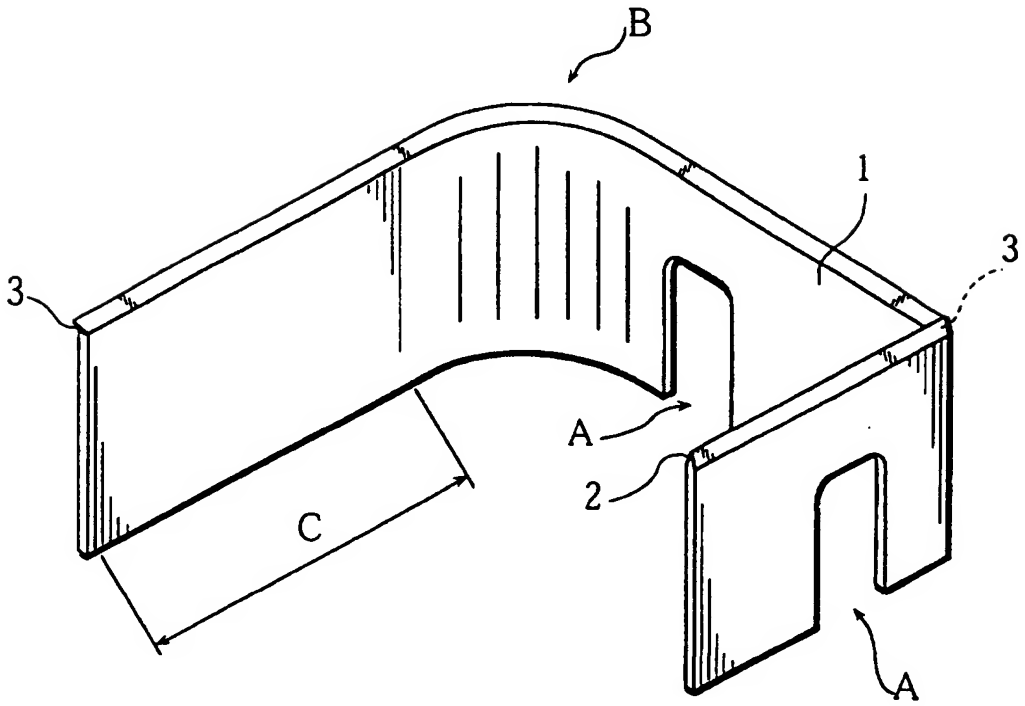


Fig. 8

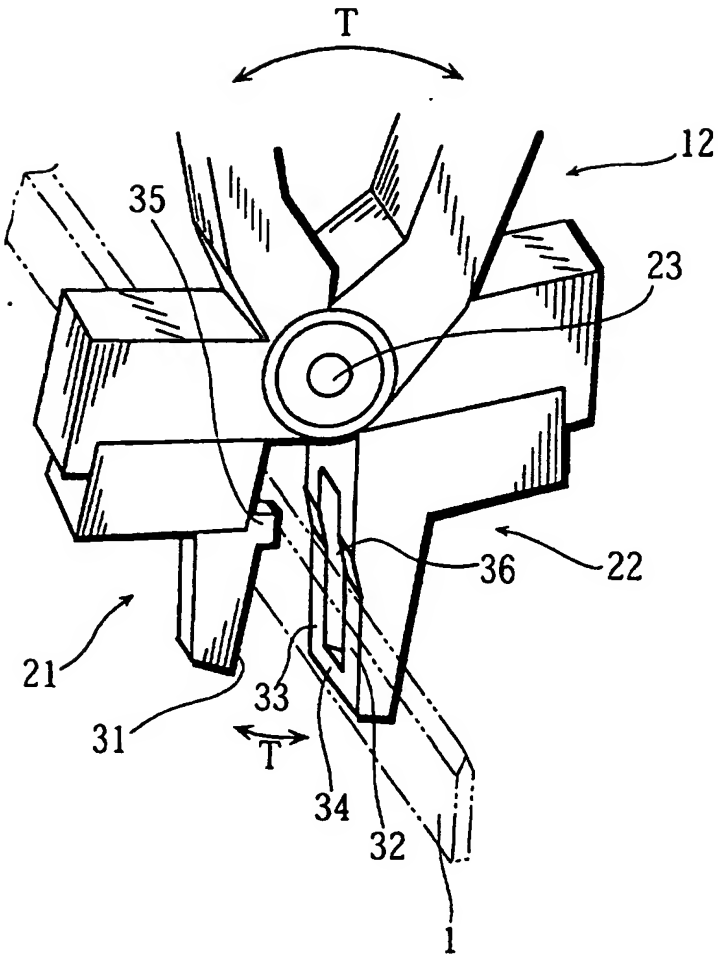



Fig. 9

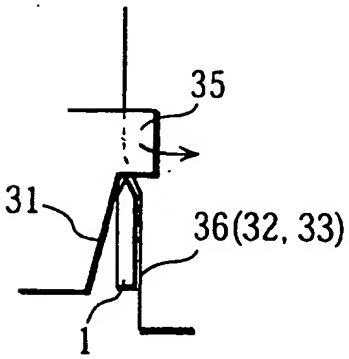


Fig. 10

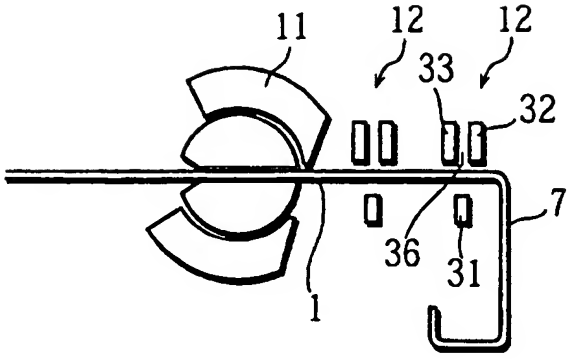



Fig. 11

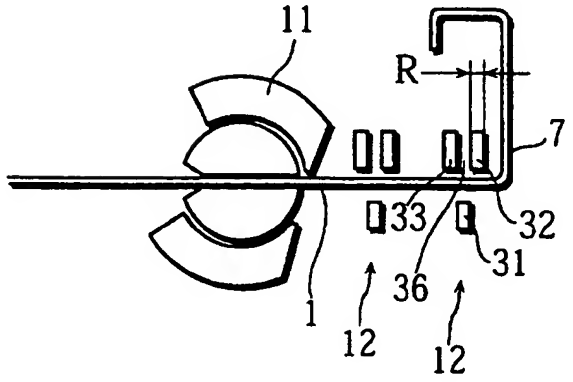


Fig. 12

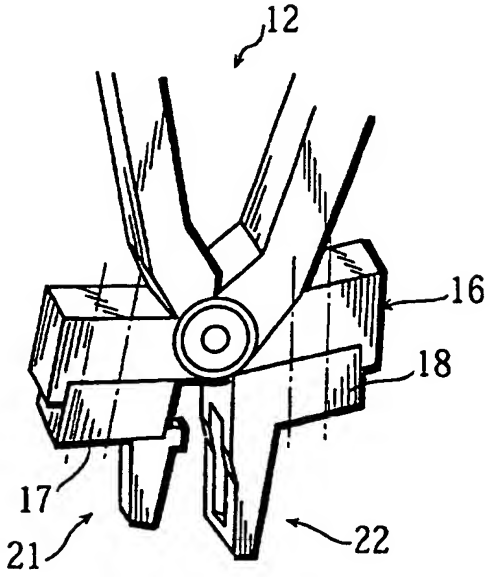



Fig. 13

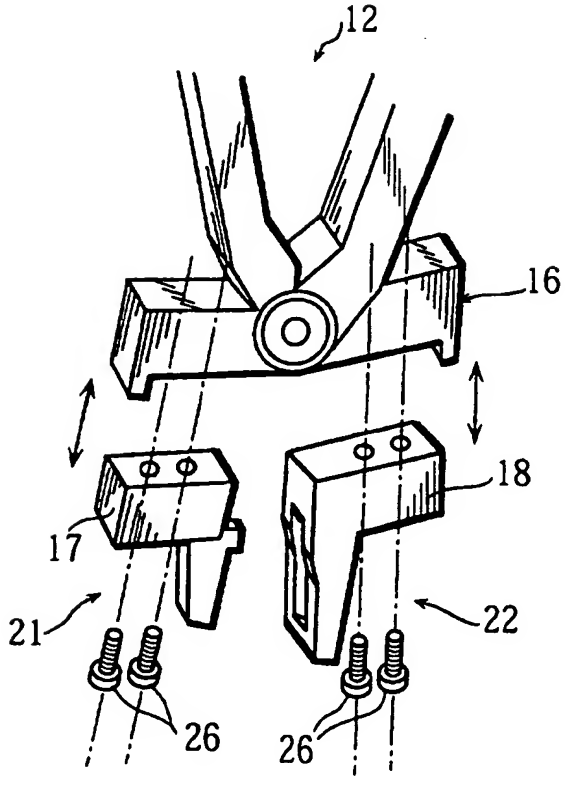


Fig. 14

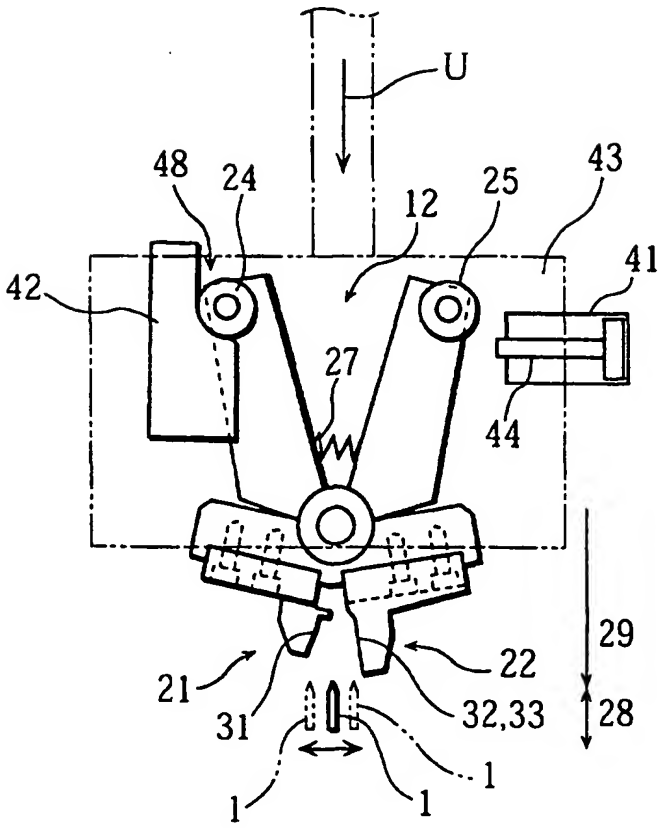


Fig. 15

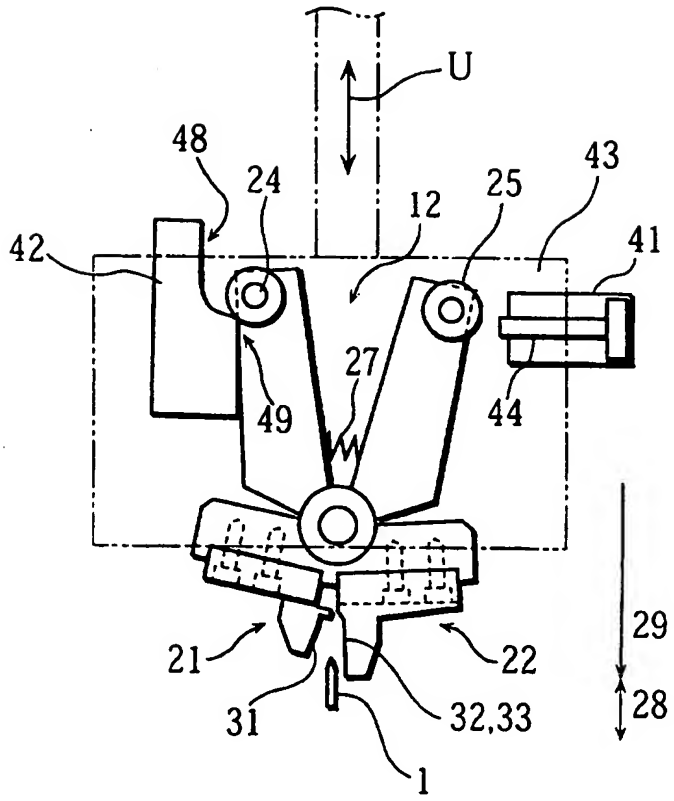
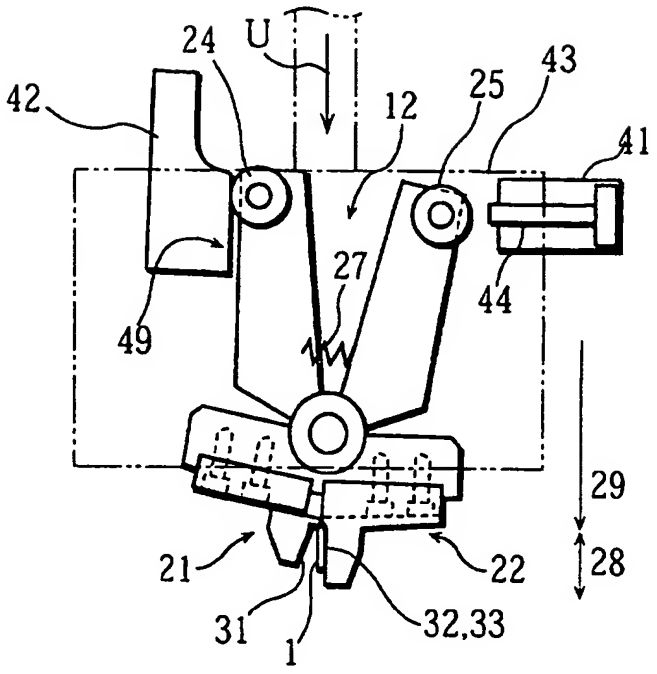


Fig. 16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24
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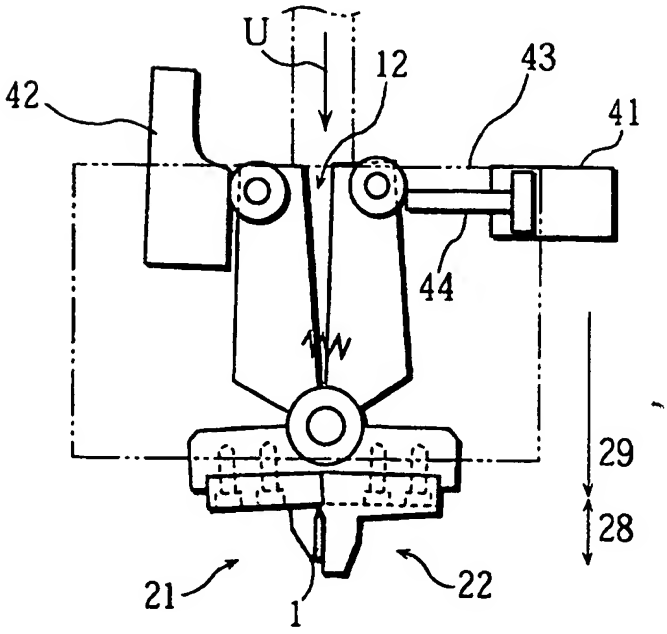
Fig. 17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1

Fig. 18

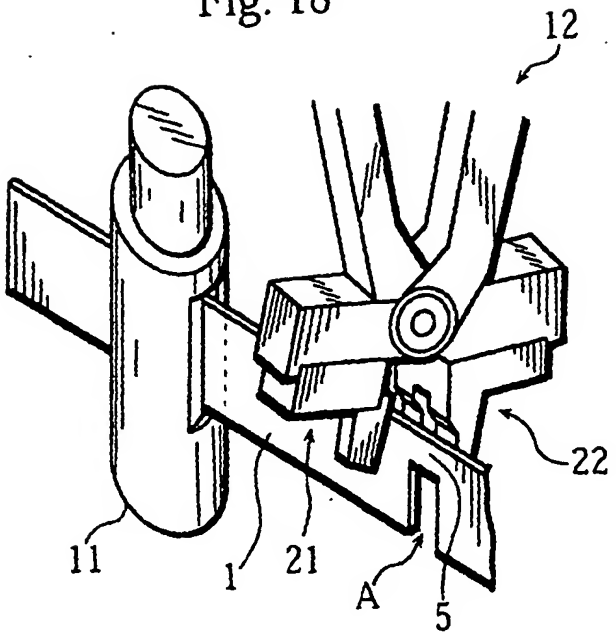


Fig. 19 PRIOR ART

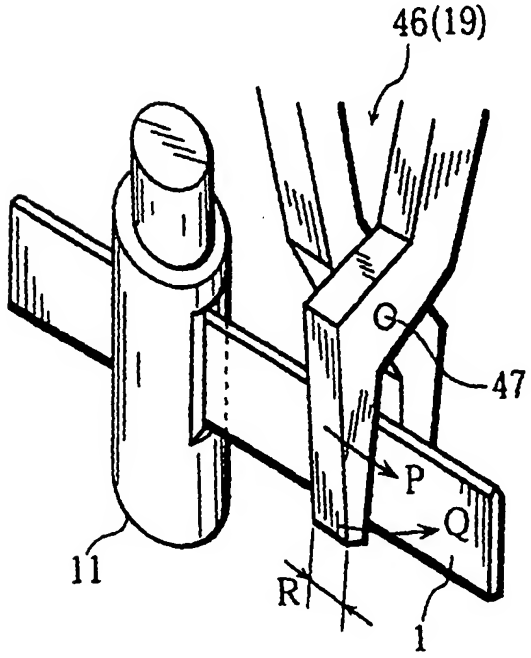

Fig. 20 PRIOR ART

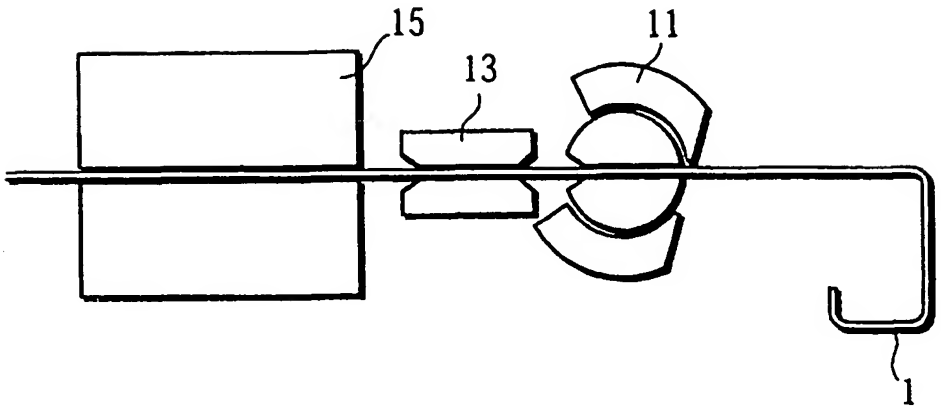


Fig. 21 PRIOR ART